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THE WORK OF THE BLACKS MOUNTAIN EXPERIMENTAL FOREST

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
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June 1953

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THE BLACKS MOUNTAIN EXPERIMENTAL FOREST

California Forest and Range Experiment Station
Forest Service, U. S. Department of Agriculture

Forest management research in northeastern California is centered at the Blacks Mountain Experimental Forest, an area of approximately 10,000 acres in the ponderosa and Jeffrey pine type of California's northeastern plateau, commonly called "eastside" pine. This type occupies approximately 3,800,000 acres of which about 2,600,000 acres support sawtimber at present.

The Blacks Mountain Experimental Forest has a wood-producing capacity, or site rating of between 3 and 4, in a 5-site classification for ponderosa pine. The tree species present are predominantly ponderosa and Jeffrey pine with scattered white fir and incense cedar. The average volume per acre before cutting was 18,485 board feet.

Ponderosa pine stands appear from a sweeping view to be all aged. Although this may be true for large areas, when the forest is viewed closely the trees are seen to occur generally in small even-aged groups. Each group is uniform in respect to age, species composition, stocking of both overstory and understory (advance growth) and other factors affecting silvicultural treatment. The different groups are now commonly called condition classes. Duncan Dunning, formerly Chief of Forest Management Research, and his associates at the California Forest and Range Experiment Station first recognized this patch-wise distribution and developed theories of forest management and silviculture from numerous earlier studies. J. W. Bongberg and associates in the Bureau of Entomology and Plant Quarantine have developed a method of insect control for "eastside" pine.

1. The Conversion Trial

The first objective of the experimental forest is to provide a large scale test of the theories developed by Dunning, Bongberg, and others for converting a virgin or wild "eastside" ponderosa pine forest to a managed forest--more specifically a forest with all age classes from seedlings to trees ready for harvest uniformly represented and adequately stocked.

The first step in the conversion is commonly called a risk, or sanitation-salvage cutting.

Insect losses in the period 1933 to 1937 were 203 board feet per acre per year. Reduction of this high insect loss in virgin stands was of first priority.

Research studies by forest entomologists showed that bark beetles choose certain types of trees for attack. This selectivity was recognized as a vulnerable point in the life history of the beetles. A system of rating degree of risk of ponderosa and Jeffrey pine to attack by bark beetles was developed by Salman and Bongberg of the Bureau of Entomology and Plant Quarantine. The trees of high risk to beetle attack make up about 15 percent of the total stand volume. Most of the mortality, 85 percent, occurs each year in these trees. Consequently a sanitation-salvage cutting in which the high risk trees were removed was adopted as the first cut. With the exception of areas held uncut for special purposes, such a cut has been applied to all of the Experimental Forest. Only 2,500 board feet per acre on the average was cut for sanitation-salvage purposes. In this way the area was covered rapidly and the high-risk trees harvested before they were killed. The practicability of these light risk cuts in ponderosa pine stands was first demonstrated on the Blacks Mountain Experimental Forest. Removal of the high-risk trees from the stand has reduced mortality about 80 percent, and the benefits of this light initial cut have been sustained for 10 years.

It should be emphasized here that a risk cut is only the first step in the conversion process.

Subsequent steps in the process of converting a forest to a managed status are aimed at bringing about adequate stocking of trees of the desired species, age, size, and quality.

Each individual unit of a specific condition class is given its appropriate cutting and all other necessary treatments at the proper time. This is "Unit Area Control" as developed by Duncan Dunning. The main treatments being applied currently are as follows:

Cutting for natural restocking is carried on in overmature condition classes with inadequate advance growth, if suitable seed trees are present and cutting coincides with a good seed crop. Units in this condition class are clear cut except for seed trees around the border. Rodents are controlled with lethal bait. Brush is piled and burned. Competing vegetation is eradicated.

Cutting for artificial restocking is carried on in overmature condition classes with inadequate advance growth and with suitable seed trees absent or no seed crop in sight. Units in this condition class are clear cut and planted. Slash is piled and burned. Competing vegetation is eradicated.

Timing is especially important in securing either natural or artificial reproduction. When an area has been prepared for reproduction, it should be restocked at once or it will be invaded by brush and other competing vegetation.

Cutting for release is carried on in overmature condition classes with adequate advance growth. The overstory is clear cut to release young growth; cutting is followed by pruning, thinning, and other stand improvement measures.

Improvement cuts are made prior to the final harvest in immature but merchantable stands. Occasional old, malformed, or defective trees are removed to improve the condition of the stand.

Cutting History

Except for 1948 and 1949, cutting has been carried on every year since operation of the experimental forest began in 1937. At the end of 1952 a total of 59 million board feet had been cut from the experimental forest. Some compartments have been cut three times since 1937. Because of the large excess of overmature growing stock the planned cut for the first 20-year period is considerably in excess of the growth we expect to get under sustained yield management. At the present time the cut is approximately 2 1/2 million board feet per year. After this first 20-year period we plan to reduce the cut to a sustained annual production of approximately 1 million board feet per year--the expected growth.

After the experimental forest had been largely subjected to a risk cut, emphasis was placed on releasing poles--trees 4 to 12 inches in diameter--because these are the trees that will be needed for harvesting first after the present merchantable timber is gone. At the end of 1947 most of the pole understory had been released.

At the present time all four of the types of cuts described above are being made. It is planned to regenerate 10 to 20 acres each year. Cutting for release of seedlings and saplings is the most common type of harvesting at present because overmature timber with advance growth of seedlings and saplings is the most common condition class. As time goes on and more of the overmature timber has been removed, increasing amounts of the harvest will come from improvement cuts.

Logging

Because of the experimental nature of this project it is highly important that the logging operation be timed and carried out according to research plans. It is also necessary that rather exact records be maintained. For these reasons the experiment station has conducted the logging with its own logging equipment. The logs are delivered to the purchaser loaded on his trucks at the woods landing.

Although the Experiment Station conducts the logging only as a necessary adjunct to the management and silvicultural operations, supervision of the logging by the research staff has yielded important by-products. For example, it gives the experiment station foresters an intimate understanding of the practical aspects of this important phase of forestry. In addition, it has enabled the staff to develop equipment and logging methods suited to the prescribed harvesting practices. Early in the initial risk cutting operation, it became apparent that efficient operation under the very light cutting would require an unusually portable loader which could be moved about easily and set up

quickly. As a result, one was designed and constructed. Today, 15 years later, light cutting is commonplace throughout the West, and numerous models of readily portable loaders and other equipment are in use in the logging industry. Hence, the Blacks Mountain loader now looks somewhat crude, but at the time it was developed, it represented a significant advance in equipment for salvage logging.

2. Field Laboratory Studies

The second objective of the experimental forest is to serve as a field laboratory for studies aimed at solving some of the specific problems arising from management by the methods which have been briefly outlined.

Investigations are under way on pruning, thinning, growth, and both natural and artificial regeneration. Results of a few of the studies are described below.

Natural Regeneration

A study to test means of securing natural reproduction of ponderosa pine in years with a good seed crop was started in 1948, which was a good seed year.

Nine areas were selected with seed trees around the borders. On six areas, having varying degrees of ground cover, rodent populations were reduced with lethal bait and the ground was scarified with a disc approximately three weeks prior to seed fall. Three areas were left untreated for checks. The results were as follows:

Summary of seedling establishment

Seed bed	Germination: Seedlings per acre	Survival at end of 4th year: Seedlings per acre	Survival at end of 4th year: Percent
Areas scarified and rodents controlled with lethal bait			
Bare ground	33,329	11,017	33
Light vegetation or ground cover	11,420	1,277	11
Medium vegetation or ground cover	3,816	139	4
Heavy vegetation or ground cover	2,914	127	4
Areas not scarified and no rodent control			
Bare ground	1,504	200 1/	13 1/

1/ At end of third year.

These results indicate that natural restocking can be obtained if an adequate seed supply is available, rodents are controlled, and a surface suitable for seedling establishment is prepared by removing competing vegetation.

Seed Production

The coincidence of seed crops with occurrence of logging, and the numbers of tree seed produced are of much importance. If advance reproduction is not already present at the time of final clear cutting, and if a fair or good seed crop does not occur within a year or two, artificial regeneration is required. Between 1942 and 1952, four light to good seed years occurred. In the other seven years few or no seed were produced. A few statistics on seed production and dissemination through October during the four years when crops occurred are shown below.

Year	Seedfall through October 1/
	No. per acre
1942	41,000
1945	4,160
1948	88,500
1952	33,038

1/ About 75 percent of the year's seed crop falls before the first of November. The remainder falls during the winter.

Growth Study

A study was started in 1937 to compare growth and losses after different methods of cutting. Each year for 10 years, four to six plots 20 acres in size were installed. The following data are based on growth for 10 years on the first four blocks of these plots.

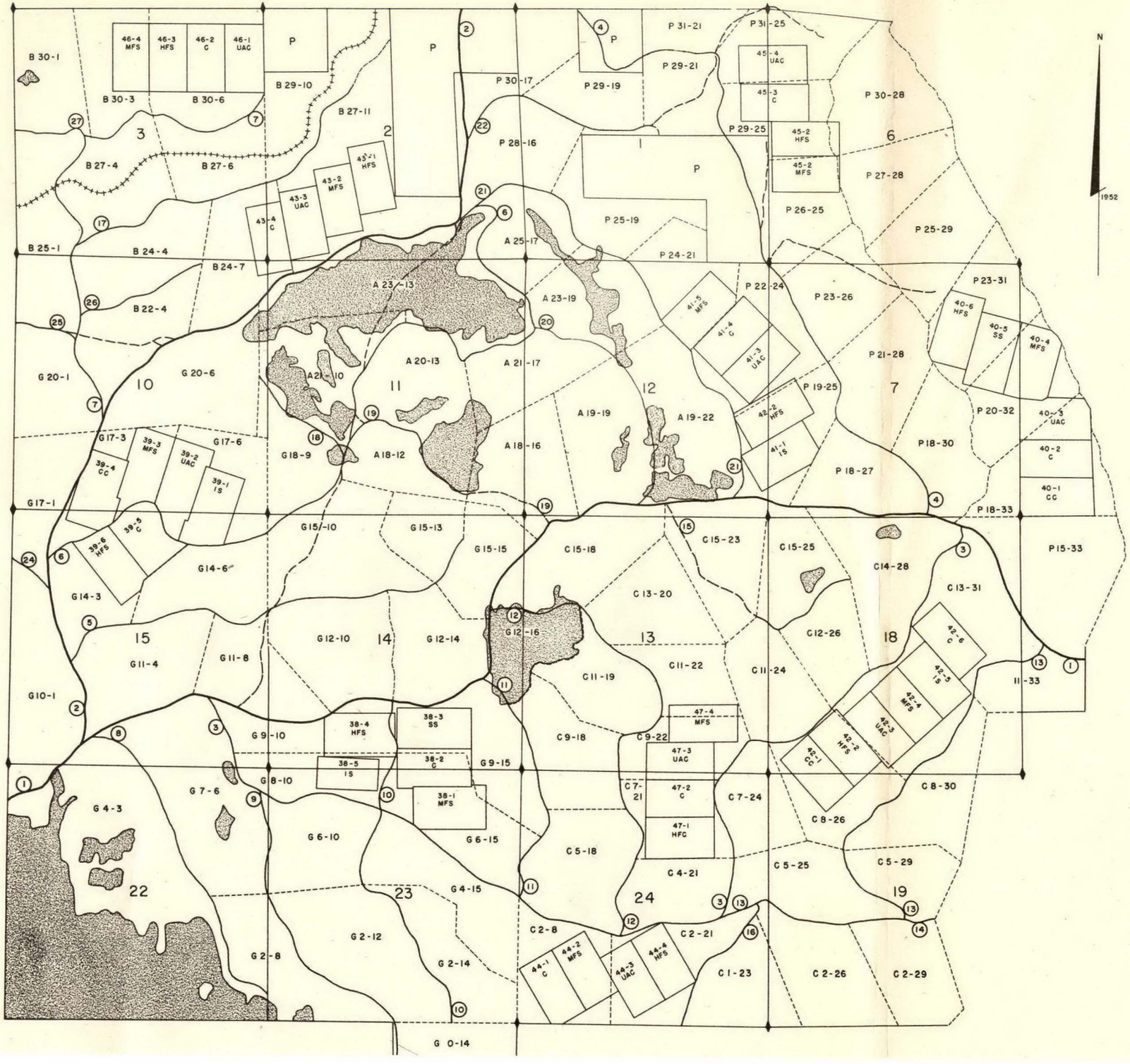
Item	Uncut	Risk cut	Moderate cut	Heavy cut	Clear cut
			board feet		
Reserved volume per acre after cutting	19,193	15,808	8,325	5,092	598
Growth per acre per year 1/	93	127	88	84	52
Losses per acre per year	101	21	16	7	1
Net growth per acre per year	- 8	106	72	77	51

1/ Includes ingrowth.

Growth was further analyzed by age-classes. By subdividing the major cutting plots into 1/10 acre units, many could be selected to represent certain age classes. The results show that stands in younger age classes grow much faster than timber more than 300 years old. Especially in the young age-class where it was possible to leave the heavier-board-foot reserve, growth was strikingly higher.

Age class (years)	Average reserve volume per acre	Average net growth per acre per year 1/	Basis -- 1/10 acre units
	(board feet)	(board feet)	
75 - 150	5,757	184	300
75 - 150	21,512	393	17
300 +	21,522	103	402

1/ For the first ten years after cutting.



BLACKS MOUNTAIN EXPERIMENTAL FOREST

CALIFORNIA FOREST and RANGE EXPERIMENT STATION
FOREST SERVICE - U. S. DEPARTMENT OF AGRICULTURE

SCALE
0 .25 .50 .75 1 MILE

- Road, Compartment boundaries
- Secondary road
- Nontimbered land
- P — Patented land
- 39-6 HFS — Method of cutting plots

AD-33 Bookplate
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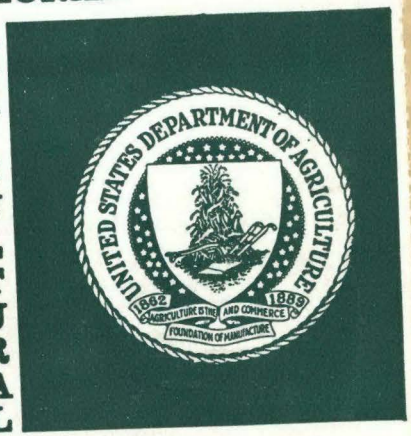
NATIONAL

AGRICULTURAL



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